Asphalt Institute Quarterly

JANUARY, 1959

In this issue:

OPERATION OVERLOAD at Columbus Air Force Base

ASPHALT INSTITUTE MOTION PICTURES

All Produced in 16mm, Color and Sound

These Asphalt Institute films are available on a loan basis or they may be purchased. Inquire at your nearest Asphalt Institute office (see list on page 15) for full information.

TESTING ASPHALTIC MATERIALS

This film briefly explains the standard types and grades of asphalt produced from the refining of crude petroleum, then demonstrates the specification tests which are commonly used for controlling the characteristics of these materials. Included are tests such as penetration, ductility, loss on heating, distillation, etc. Length: 1330′ Running time: 36 min.

ASPHALT THROUGH THE AGES

This film, through imaginative animation techniques and actual photography, follows the use of asphalt from ancient times in the Middle East, to present day applications in building materials, water control and its major use, asphalt highways. It also explains briefly the refining of asphalt from petroleum. Length: 486′ Running time: 13½ min.

TWO ROADS

The fascinating story of how two roads, one paved with asphalt, the other with concrete, were built and how they are serving the motoring public. Prepared especially for television showing and for presentation of businessmen's clubs, non-engineering groups and the general public. Length: 502′ Running time: 14 min.

ASPHALT—THE MAGIC CARPET

Tells non-technical story of advantages of asphalt pavement construction through medium of actual present-day American Town Meeting. Laboratory demonstration of asphalt's physical properties. An introduction to asphalt for the general public. Length: 940′ Running time: 26 min.

SEAL COATS

Methods and procedures for applying asphalt seal coats and light surface treatments. Length: 590′ Running time: 16½ min.

THE GARDEN STATE PARKWAY (New Jersey)

Story of asphalt construction on this beautiful 165-mile parkway that serves New Jersey's popular shoreline resorts. Length: 516′ Running time: 14½ min.

THE NEW JERSEY TURNPIKE

Construction of this famed superhighway from foundation to finished asphalt pavement. Length: 880′ Running time: 24½ min.

THE TURNER TURNPIKE (Oklahoma)

Procedures employed in constructing Oklahoma's 88-mile, heavy-duty asphalt toll highway. Length: 875′ Running time: 25 min.

HEAVY-DUTY HIGHWAYS WITH HOT-MIX ASPHALT

Heavy-duty asphalt highway construction in the United States. Shows how materials are obtained and assembled, with complete asphalt plant operation. Length: 865′ Running time: 24 min.

ASPHALT IN HYDRAULICS

How asphalt is used to pave and protect such hydraulic installations as dams and dikes, canals, reservoirs, jetties, groins. Shows equipment and construction methods employed. Newly revised. Length: 800′ Running time: 22 min.

FROM BYWAY TO SUPERHIGHWAY

This film recounts the steps that have led to the development of the modern, heavy-duty asphalt highway, and includes a detailed account of how the 181 asphalt-paved miles of the Kansas Turnpike were built. For the man who doesn't know the difference between "blacktop" and modern asphalt paving, this is fascinating information about a subject touching the lives and pocketbooks of every American. Length: 590′ Running time: 16½ min.

EDITORIAL

No Penny-Ante Predicament

Is the massive road program literally running out of gas?

The question is asked in all seriousness in the light of recent developments which we can telescope in rough chronological order like this:

In the 12-year period since the end of World War II, motor vehicle registrations doubled from 34.4 million in 1946 to 68.4 million in 1958. In the same period, the gallonage of gasoline burned in these vehicles doubled from 25.6 billion gallons to 53 billion gallons.

Meanwhile, the federal gasoline tax doubled from 1.5 cents per gallon to 3 cents per gallon, and the weighted average state gasoline tax increased from 4.25 cents to 5.58 cents.

But—and this is an ominous sign—during that 12-year period, the average miles traveled per year by these motor vehicles were declining from 9,964 to 9,632, even while these same highway users were being asked to provide additional billions of dollars to build the badly needed new roads.

Now we come up to the closing months of 1958 and in Washington, which is very fond of making trial balloon ascensions, the Federal Budget Director warned that the Highway Trust Fund will soon be running into the red at a rate of about $1 billion per year. He suggested that the 86th Congress may have to give some serious thought to another hike in the Federal gasoline tax, or look elsewhere for additional highway funds.

HOW MUCH HIGHER?

There is an obvious conclusion here. How much higher can gasoline taxes go before the harried motorist invokes the Law of Diminishing Returns?

But there is another vital consideration involved here . . .

Bearing in mind that the states, themselves, depend upon gasoline levies for construction funds, *how soon will it be before the state highway departments run afoul of this same inexorable economic law?*

Some states, we regret to say, are inviting financial disorder by reckless adventures in road-building extravagance. In these states the postwar trend toward engineering responsibility and prudent husbanding of financial resources has been reversed. They have been infected with the "Ninety-itis" virus.

The Asphalt Institute has persistently risked irritating some segments of the road-building fraternity by tolling a warning against extravagant construction, not only because asphalt paving is synonymous with economy in most cases, but also because it is in the public interest to fly the storm signals.

The Law of Diminishing Returns, as a threat to the road program, is like the proverbial cloud on the horizon, no larger than your fist. But it exists. And the Institute still believes, more firmly than ever, that a maximum effort must first be made to practice every conceivable road-building economy before rummaging any deeper in the highway user's purse.

ASPHALT INSTITUTE Quarterly

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Glynn Harvey
Editor

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Robert J. Lowe
Assistant Editor

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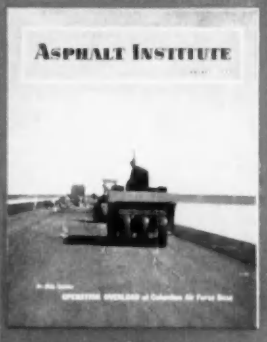
Cover

Cover photo shows final rolling of asphaltic concrete pavement at Columbus Air Force Base. Test proved a complete vindication of asphalt paving for use under heaviest aircraft loads and was a case study in proper compaction methods.

—Photo by Charles A. McKeogh



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The member companies of the Institute, who have made possible the publication of this magazine, are listed on page 15.

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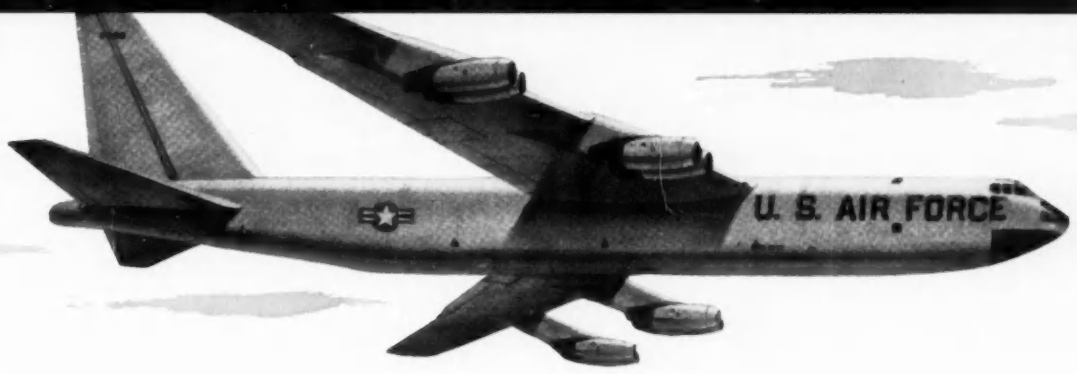
OPERATION OVERLOAD

Above: Columbus AFB project taught the critical importance of proper compaction in every course.

Right: This is the test cart which applied the equivalent of twenty years of traffic by B-52's.



SHOWDOWN TEST AT COLUMBUS AIR FORCE BASE PROVES ASPHALT-PAVED RUNWAYS CAN "TAKE IT."

WHEN the Air Force ruled out asphalt paving for heavy bomber bases, it fell to the portion of Mr. John M. Ferry, Special Assistant for Installations, to defend the policy. Consequently, it was Mr. Ferry who, on July 3, 1957, stood before an investigating subcommittee of the House Armed Services Committee and insisted that, despite all the evidence to the contrary, he still regarded asphalt paving as unsuitable for military airfields.

Congressman William Bates of Massachusetts asked what it would require to convince him otherwise.

"I would like to see some evidence presented in the form of an accelerated test, sir," replied the Air Force spokesman.

SIMULATED B-52 LOADS

And so the subcommittee ordered such a test, to be conducted by the Corps of Engineers at a site to be designated by the Air Force and the Corps. They agreed on a section of runway at Columbus Air Force Base in Mississippi, then under construction. It was further agreed that the test would simulate B-52 loads partially airborne at time of takeoff and landing, and would approximate normal year-round usage over a span of ten to twenty years.

The conditions were these: A load of 212,000 pounds, traveling on a single four-wheel B-52 landing gear with tire pressures of 266 psi, would make 5,000 coverages (20,000 passes) on the test section. The test was to be applied to a 200-foot strip of runway to be selected by the Air Force.

The Columbus Air Force Base lies in the rolling hill country along the Tombigbee River. The underlying soil is predominantly sandy clay with large areas of silts and clays, ranging in depth from two to nine feet. Beneath these soils are silty and clayey sands and gravels. Design of the pavement structure called for the following cross-section and descending order:

- 4″ asphaltic concrete surface and binder
- 11″ crushed gravel base (CBR-100+)
- 10″ sand-gravel subbase (CBR-40+)
- 7″ clay-gravel subbase (CBR-20+) 100% Mod. AASHO Density
- 6″ clay-gravel subbase (CBR-20+) 95% Mod. AASHO Density
- 60″ (fill) cohesive material subgrade, ranging from 85-95% Mod. AASHO Density

THE RAINS CAME

The start-work order at Columbus was the signal for Jupiter Pluvius to get into the act. The most unrelenting rains in years made a mockery of the construction schedule and had the asphalt paving champions gnawing their fingernails in alarm. Between December of 1957 and the following August, the construction site was drenched with 42 inches of rain. During the critical month of July alone, more than nine inches of rain fell at the air base.

Not only did the rains wash out the original schedule, it also complicated construction in the important base courses. The engineers recognized that the test pavement could very well stand or fall on the performance of these lower courses where some consolidation might be expected under the heavy wheel loads.

SUBBASE SATURATED

Densification of the sand-gravel and clay-gravel subbases was difficult enough, with the need to maintain optimum moisture content during compaction. But the incessant rains caused saturation in the lower portion of the sand-gravel subbase even as, at the same time, an excessive amount of water was being added for densification in this course.

The upper subbase material originally was a clay-gravel, but the Corps of Engineers found this plastic material unsuitable, lacking the necessary stability for an airfield pavement. However, it was regarded as sufficiently stable for use in the lower subbase course, 25 inches below the finished grade. So, this material was excavated to a depth of ten inches and replaced with non-plastic sand-gravel fill of higher stability value.

Examination of this sand-gravel material indicated it might be subject to particle rearrangement under heavy loads. During construction, limestone dust was added to improve the "setting up" quality, although the material remained non-plastic and lacked sufficient bond between the particles to resist consolidation under heavy load. Developments during the testing of the pavement appear to have confirmed this suspicion, and confirmed also the engineering judgment that full proof rolling of the base and subbase courses would have prevented any measurable deformation in the pavement.

PAVEMENT STRONGER AFTER TEST

Actually, this particle rearrangement under loads represents an increase in the bearing strength of the material. This is what happened at Columbus. One of the important lessons learned on the project was that adequate proof rolling of the base courses will almost certainly prevent this consolidation, and it has been suggested that proof rolling procedures might be altered as follows:

Non-plastic sand and gravel lower courses should be placed in layers not to exceed six inches, then compacted with a seven-wheel, 30-ton pneumatic tire roller, or one loaded to four tons per wheel with tire inflation to 90 psi. Then, while the material is still slightly below optimum moisture content, thirty coverages would be applied with a 60-ton four-wheel proof roller with tire pressures of at least 150 psi. This would be expected to reduce consolidation by at least 85 percent.

The base course consisted of eleven inches of crushed gravel with 18 percent crushed slag added to supply the one-inch aggregate size and increase the fractured particles to the specified 75 percent. Five to ten percent of minus 200 material was found necessary to obtain the desired density and it was necessary to add eight percent limestone dust to "set up" the non-plastic base course. It also was learned that the minus 40 fraction should be at least 15 percent for desirable density during construction.

This free draining material did not retain moisture long enough to permit complete rolling before the moisture content fell below optimum, and the engineers learned that it was advisable to seal in the moisture by pneumatic tire rolling directly behind the aggregate placing machines. Attempts to add moisture by sprinkling truck resulted only in flushing the surface fines.

ASPHALT CONTENT REDUCED

Anticipating greater compaction under heavy wheel loads, the engineers designed the asphaltic concrete binder and surface courses with a twenty percent reduction from optimum asphalt content for the test section and the center 75 feet of the runway pavement. This resulted in a asphalt content of 4.5 percent for the surface course and 3.5 percent in the binder. This lean mix was subjected to breakdown rolling with a three-wheel steel roller loaded to ten tons which made a single coverage. Then followed six coverages with a 30-ton seven-wheel pneumatic tire roller with tire pressures of 90 psi.

Experimental use of the pneumatic tire roller for breakdown rolling disclosed that specified density of 98.5 (of laboratory compacted specimen) could be achieved with three coverages of this type roller at lower mix temperatures. It was found that the mix temperature could be lowered from 300-325°F to 280-300°F with a corresponding decrease in breakdown rolling temperature from 270°F or higher to 260°F.

The mix design required a Marshall stability of 1800 with 2-4% voids. Stability of the mix was found to depend upon the amount of limestone screenings and every effort was made to limit the amount of natural sand used. Following are the proportions used and the job mix formula:

Binder Course	Surface Course
Crushed limestone—53%	Coarse gravel—46%
Limestone screenings—21%	Limestone screenings—36%
Coarse sand—19%	Coarse sand—9%
Fine sand—7%	Fine sand—9%

Job Mix Formula

Sieve Size	% Passing (Binder)	% Passing (Surface)
1	100	100
3/4	92	94
1/2	76	85
3/8	—	65
4	51	48
10	37	36
20	—	28
40	22	15
80	14	4.5
200	5.2	4.5
Percent asphalt (85-100)	3.5	—
Stability	2450	1989
Flow	7	6
Voids	9.0	6.5
Voids filled	46.0	60.0

Load testing of the finished runway section, originally scheduled for early summer, finally got underway on September 4 and continued to September 28 when the huge test cart lumbered through its 5,004th coverage shortly after noon.

Performance of the test pavement was entirely satisfactory. Early in the testing some slight consolidation was detected but it did not progress, and at no time was it evident to the naked eye, even after excavation pits were dug at the conclusion of the test. Laboratory examinations are now being made to determine the layer, or layers, where consolidation occurred.

The asphaltic concrete surface itself showed no evidence of rutting or shoving, even where the heavy load cart reversed direction. The pavement has every appearance of being as sound and as smoothly textured as the day it was laid down.

RIGID PAVEMENT CRACKED

On the other hand, the adjoining rigid pavement—although not under test, developed early and progressive cracking where the test vehicle reversed direction for return trips over the asphalt section. This cracking in the rigid slab presented a serious question of how long it can continue to carry prototype traffic without total replacement.

Proof rolling of the base course was done with this vehicle.

Two asphalt spreaders worked in tandem to maintain hot joints.

Aerial view of Philadelphia airport showing lengthened jet-age runway.

PHILADELPHIA AIRPORT S-T-R-E-T-C-H-E-S WITH ASPHALT

THE JET AGE portends innumerable changes in the field of public transportation. Certainly, the geography of the world will shrink by at least 30 percent. The distance from New York to Paris will diminish to less than six hours. The urgency for a more sophisticated communications and traffic-control system is already upon us. Weather forecasting techniques are being revised to accommodate the swift point-to-point movement of these new passenger aircraft.

Of paramount importance is modification of existing facilities to provide longer and more durable runways to handle jet aircraft safely and conveniently.

The administration of the Philadelphia International Airport has moved quickly and decisively to project its operations into the jet age by resurfacing an existing runway with smooth, durable asphaltic concrete, and extending this project to include 2216 feet of additional runway. The resurfacing of the old 7284-foot runway was accomplished in the remarkably short period of less than four weeks at a cost of approximately $200,000.

ASPHALT EFFICIENCY

Only by using asphalt could this undertaking have been carried out so economically and with such minimum operational interference.

Flexible pavement was specified for the original runway by staff engineers of the Philadelphia Airport partly because of an unstable subsoil and anticipated settlement. After many years of use, the decision to use asphalt has been amply justified. Slight deformations in the surface, caused by foundation settlement, were quickly and economically repaired. In addition, strengthening of the runways to accommodate the heavier aircraft was conveniently accomplished at a low cost. Thus, when faced with the task of resurfacing and extending the runway, the engineering staff logically chose asphalt.

The old runway was resurfaced to 75 feet on either side of the centerline with 2½ inches of hot asphaltic concrete and the remaining 25 feet on either side were built up with sand-asphalt feathered out to the edges. Depressions of more than one inch in the old surface were erased with a leveling course of hot asphalt concrete binder material.

Compaction was achieved with two ten-ton, 3-wheel rollers during the breakdown stage, a secondary rolling with a 25-ton pneumatic roller, and a final rolling with two 16-ton, 3-axle tandems. The over-all workmanship is described as "excellent."

COST ONLY $400,000

Construction of the 2216-foot extension, also 200 feet in width, has just been completed at a cost of approximately $400,000. The subbase was compacted to 98 percent of its theoretical density and on this was placed four feet of run-of-bank sandy gravel compacted in the same fashion. One inch of screenings was then placed, so that the bottom section of the stone base is well choked, and was followed by eleven inches of water-bound macadam.

After the addition of two inches of hot, compacted asphaltic concrete binder, 1½ inches of wearing surface were placed and compacted. The binder and wearing surfaces were put down with two Barber-Greene pavers followed by two 3-wheel rollers for the breakdown rolling, then by a 25-ton pneumatic roller, and lastly by two 3-axle, 16-ton tandems for finish rolling. The excellence in workmanship equals that of the resurfacing.

The use of asphalt paving has made possible the rapid and economical expansion necessary at the Philadelphia International Airport in order to accommodate the faster, heavier jet aircraft anticipated with a minimum of operational interference. Airport patrons are assured a safe, smooth landing surface and its administrators, in turn, are guaranteed an installation which should provide a long and useful life with minimum maintenance costs.

GREEN HILLS, RED

Vermont's penny-wise Yankees select as

THE VERMONT man is basically frugal and provident. He regards personal and public debt with loathing and can never reconcile himself to extravagant expenditure.

This is the nature of the Vermonter. Slow to commit himself and even slower to change, he dwells in a comfortable world of green hills, red barns and black roads. The color scheme suits him.

Characteristically, Vermont took a long and careful look at its Interstate System. And methodically, it began at the southern root of what, ultimately, will become a 321-mile Y that will follow the Connecticut River from the Massachusetts line to the key railhead at White River Junction, then will angle north and northwest across the spine of the Green Mountains, to Canada.

FIRST LEG OF SYSTEM

The first leg of this sprawling network is a 5.9-mile segment of four-lane divided highway, designated as Interstate Route 91, from the Bay State line north to the outskirts of Brattleboro. Completed last fall, it was built in the sturdy Vermont tradition of asphalt economy.

It was during the days of the Roosevelt ascendancy that Jim Farley turned a well-worn phrase inside-out and observed that "as Maine goes, so goes Vermont." Appropriately, Vermont's first I-road project was performed by the Maine contracting firm of W. H. Hinman, Inc., which set the pattern for modern, heavy-duty asphalt paving on the Maine Turnpike a decade ago. The Maine Turnpike was the

D BARNS AND BLACK ROADS

elect asphalt for their first Interstate project

clincher that convinced a lot of engineering skeptics that asphalt paving can do anything that is asked of it.

Vermont needed no convincing. Steeped in a tradition of demanding full value for her dollar, Vermont logically selected the pavement that has served northern New England through winter blizzard and spring thaw.

COST WAS LOW

Cost of the pavement structure was low, again in the aggregate-rich tradition of a country littered with glacial debris. For approximately $4.80 per square yard, the State of Vermont got a rugged asphalt pavement that consists of the following courses:

24 inches of crushed rock sub-base ($2.35 per square yard);
8 inches of crushed stone base ($1.11 per square yard);
a prime; and
3 inches of bituminous concrete binder and surface course ($1.23 square yard) . . .

For a total structural thickness of 35 inches!

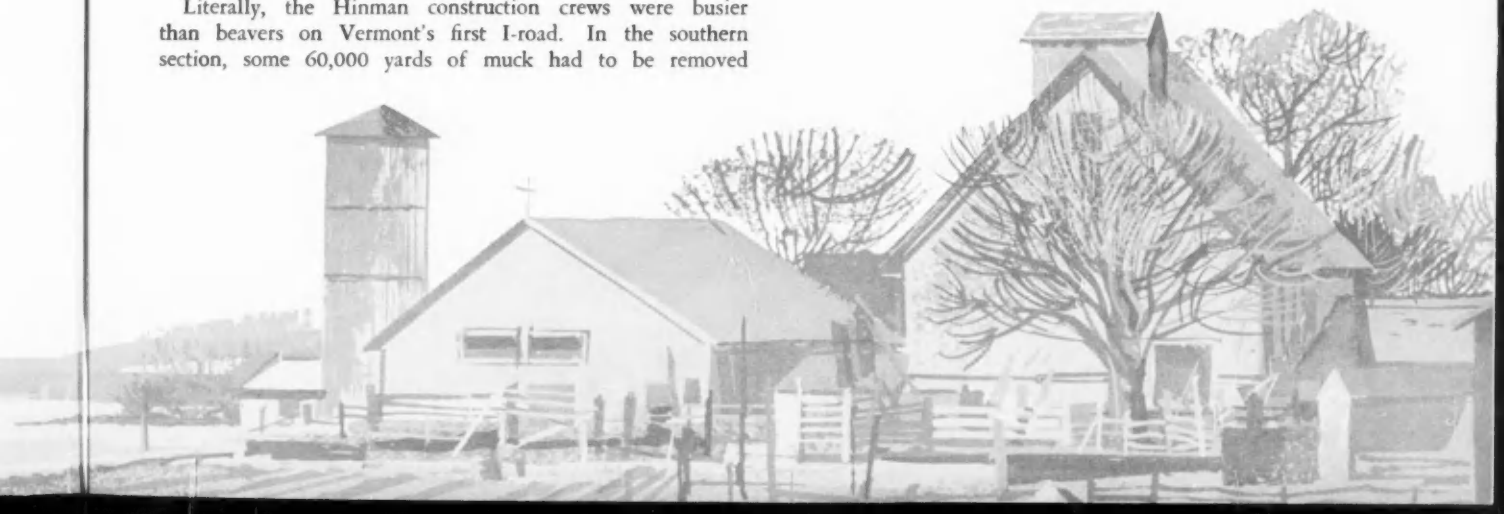
Literally, the Hinman construction crews were busier than beavers on Vermont's first I-road. In the southern section, some 60,000 yards of muck had to be removed and replaced with broken stone and gravel. By night, a persistent clan of swamp beavers who hadn't been consulted on the project fought tooth and nail for their homes, building dams which the construction workers had to tear down every morning. Eventually, the beavers decided that this thing was bigger than all of them, and gave up the fight.

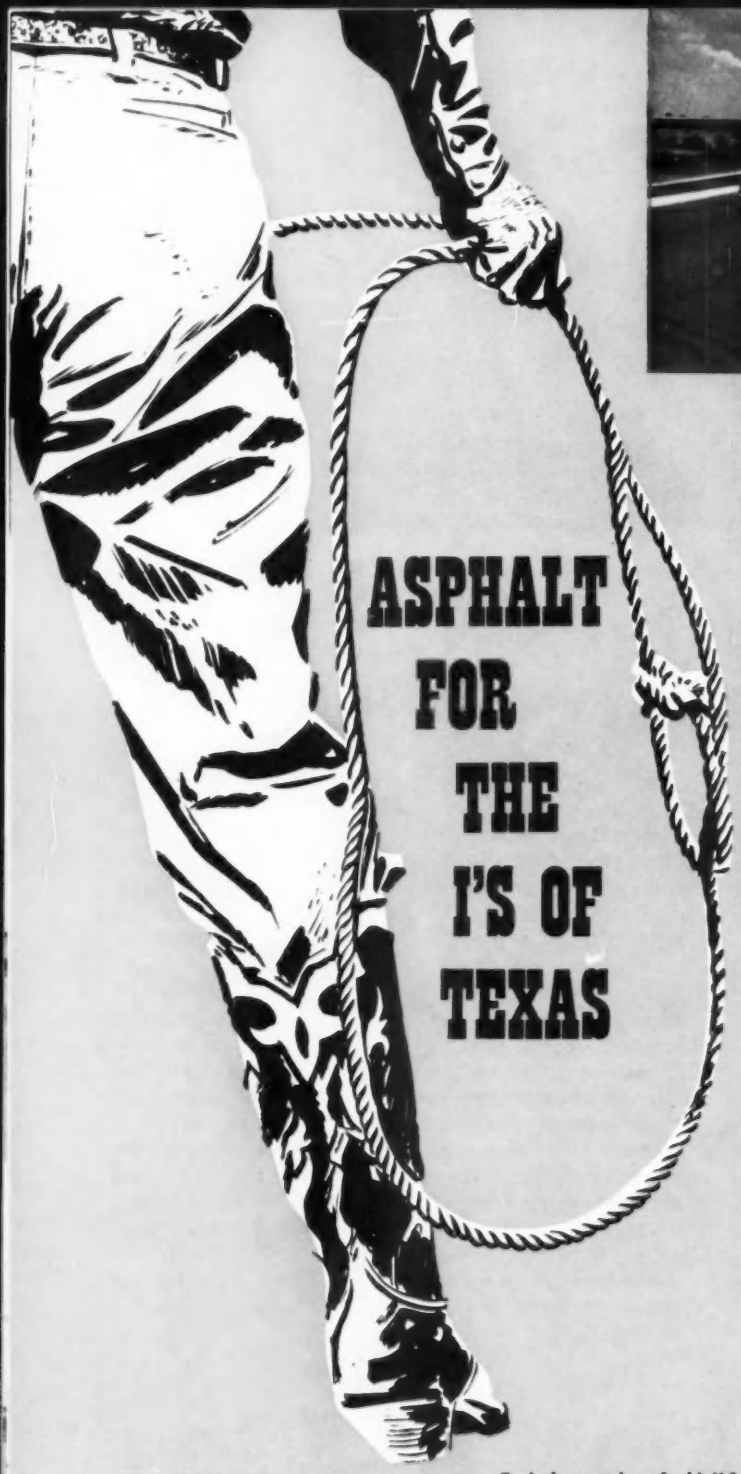
ON TO BELLOWS FALLS IN '59

Next year is expected to see extension of I-road 91 from Brattleboro north to Bellows Falls. Meanwhile, work probably will be started on the northwestern leg of the Y between the capital, Montpelier, and Vermont's largest city, Burlington, on the shore of Lake Champlain.

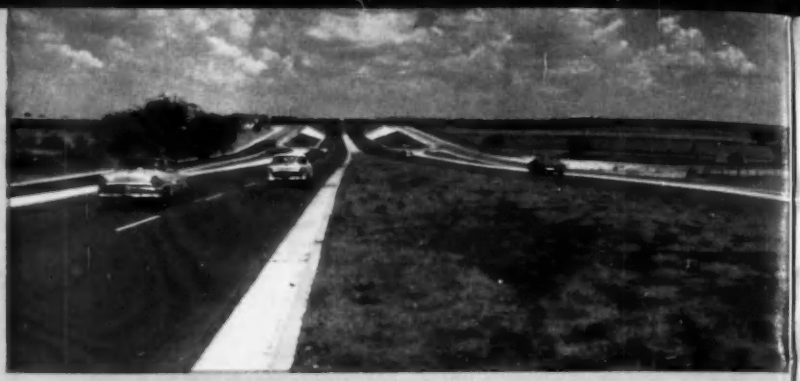
Vermont's dollar-wise Yankee have a long record of experience with asphalt paving. For that matter, they've observed both major types of pavement under the conditions that apply in the Green Mountain State. They made their decision two decades.

Vermonters, as Jim Farley wryly observed, are not inclined to be capricious.





ASPHALT FOR THE I'S OF TEXAS



View north along Interstate Route 35 in McLennan County, Texas.

WHEN JESSE CHISHOLM drove his wagon over the endless plains, from San Antonio to Kansas, he carved a track which was destined to become one of the busiest highways in Texas.

From Chisholm Trail to U.S. Route 81 is a saga that spans a century of Texas growth. And now, Interstate Route 35 is beginning to take shape, roughly paralleling the historic old Trail, opening a new chapter in the transportation history of the State.

ASPHALT ON THE TRAIL

For Texas, the Interstate network represents some 3,000 miles of modern expressways. A substantial part of these superhighways (59 percent of those under contract at the end of fiscal 1958) will be paved with modern, heavy-duty asphalt. Typical are two sections completed and opened to traffic last summer on I-road 35, both casebook examples of the economy and superior riding quality of this type of pavement.

Example A: 4.387 miles of four-lane divided highway in Travis County between Slaughter Creek and the Hays County line, consisting of 24-foot-wide driving lanes flanked by 10-foot surfaced parking shoulder and five-foot surfaced median shoulder.

Design called for 15 inches of compacted flexible base, full width of the roadbed, with the top two inches processed with emulsified asphalt. This based was topped off with $2\frac{1}{2}$ inches of asphaltic concrete laid in two courses for the driving lanes. Shoulders received a double surface treatment. Total cost for pavement structure, including shoulders, was about $2.71 per square yard of driving lane.

DESIGN VERSATILITY

Example B: 7.891 miles of McLennan County to the north, between Lorena and the southern limits of Waco. With the

Typical examples of old U.S. 81, showing condition of the slab pavement and older asphalt section.

exception of a slightly wider median shoulder, geometric design was identical with Travis County project. But the pavement design was strengthened to compensate for poorer subgrade soils. The 2½ inches of asphaltic concrete rests on only 12 inches of flexible base, but supporting this structure is a 9½-inch foundation course, and beneath that six inches of lime-treated subgrade soils.

Since the area is virtually devoid of flexible base material, long hauls and increased thickness of the pavement structure doubled the cost per square yard, as compared with Example A. Nevertheless, cost of this modern asphalt pavement was held lower than a 3.87-mile section of rigid pavement that was installed immediately to the south of the project at the same time. This latter project consists of a slab of 12-inch uniform thickness on six inches of base course.

Motorists unanimously proclaim the asphalt-paved section smoother riding.

A STUDY IN CONTRASTS

Midway between these two asphalt-paved stretches of I-road 35, in Bell County, are about 15 miles of old U.S. Route 81, now relegated to frontage road service for the new Interstate highway. These 15 miles of road offer an interesting study in comparative pavement types in terms of service.

About two-thirds of this mileage is an asphalt pavement, sadly under-designed for the traffic it was called on to carry, and laid down in 1932. Total structural thickness of the pavement ranged from 4.5 inches to 8.5 inches and had a design sufficiency rating when built of about 28 percent of the strength usually provided for current wheel loads. Additional overlays and seal coats between 1932 and 1955 added about 2.75 inches of thickness and raised the pavement's sufficiency rating to about 47 percent.

The 5.3 miles of adjoining rigid pavement, laid in 1936, had an average uniform slab thickness of 6.3 inches on 3.5 inches of gravel base. The original design had about 70 percent of strength sufficiency based on contemporary wheel loading, and was supported by much better subgrade soil than underlying the asphalt section.

TIMES'S OLD STORY

In 1955, the 19-year-old rigid pavement was in such a sorry state of deterioration that it had to be undersealed with asphalt, partially patched by removing shattered slabs, then overlaid with two inches of asphaltic concrete. Although the 23-year-old adjoining asphalt section was in excellent repair, a thin overlay was added during the 1955 overhaul operation for the sake of establishing a uniform riding quality and appearance throughout.

Total expenditures for base and surface construction and maintenance of the 19-year-old rigid pavement at that time was $34,627.39 per mile. For the 23-year-old asphalt pavement, the total was only $27,861 per mile.

Today, the original slab pavement is just a memory, but the original asphalt pavement lives on to serve another era of usefulness as a frontage road for the parallel highway of tomorrow.

With the eyes of Texas fixed on the I's of Texas, these examples of asphalt's remarkable versatility, durability and economy on and along Interstate Route 35 are prime showcase exhibits of an engineering philosophy that is winning new friends every day.

IN THE PLANNING STAGE

TIME has an insidious way of sneaking up on you. It's inconceivable that we are trembling on the brink of our tenth anniversary, but there it is. Come April, and the *Quarterly* will be rounding the clubhouse turn into its second decade of existence.

Obviously, it would be unthinkable to let the occasion pass without some kind of quiet observance. So, this is to put our 52,000 avid readers on notice that, with their April issue, we are renewing their subscriptions for another ten years.

Meanwhile, the first major league asphalt-paved turnpike also has rounded out a full decade of service and we feel it is only appropriate to toast the Maine Turnpike in a beaker of statistics. By way of preview we can tell you that, based on engineering estimates, the original 47-mile section was paved with asphalt at a saving of $972,745. Total cost of maintenance over the 10-year span of life has been $253,415—leaving a cushion of $719,330 to be applied against future maintenance out of original savings.

WATER OVER THE DAM

Since the life-span of the *Quarterly* has coincided with the so-called Turnpike Decade, we'll also examine the other great asphalt-paved toll roads and see how they are performing.

With one eye cocked to the future, we'll travel a section of spanking new Interstate highway in Nevada where a double-barreled ribbon of asphalt pavement follows the winding Truckee River. And speaking of water, it's been quite a while since we sat down with the hydraulics engineers to find out what's new in their department. One recent monumental undertaking in this field was the paving of the upstream slope of the Montgomery Dam in Colorado. Another unusual project was the resurfacing of an old portland cement concrete canal lining near Boise, Idaho. We may also take a run down to the beach and see how those asphalt groins at Ocean City, Maryland, are performing after three storm-swept winters.

Be with us, won't you, when we celebrate our tenth anniversary?

Nevada Interstate Project of U.S. 40 along the Truckee River.

Louisiana's

The author is Testing and Research Engineer for the Louisiana Department of Highways and past president of the Louisiana Engineering Society. He is a member of the AASHO, SASHO, Highway Research Board, and represents his state highway department in ASTM.

"FLOATING" ROAD

Base of Swamp Road is Wrapped in Waterproof Asphalt Blanket

by H. L. Lehmann
Testing and Research Engineer
Louisiana Department of Highways

HIGHWAY CONSTRUCTION is sometimes grim, often thankless, but never uninteresting. Consider what we ran into on old State Route 42 . . .

Route 42 travels in a southerly direction to the Gulf of Mexico, down there in Cameron Parish where Louisiana digs the heel of her boot into the flank of Texas. This is bayou country—mostly lakes and marshes and waterfowl refuges, with a scattering of small communities loosely connected by a skeletal system of roads.

The foundation of the highway between Creole and Gibbstown Ferry is rooted in the coastal marshes and is composed of an organic muck over a light to medium silty blue clay. Needless to say, the underlying material is completely saturated and, in effect, this section of road is floating. The original fill was surfaced with a thin crust of clam and reef shell which served to carry the occasional traffic to the lower edges of the parish.

OIL BOOM BRINGS TRUCKS

But development of the offshore oil deposits in the Gulf brought a steadily rising volume of traffic with increasingly heavy wheel loads. The old shell surface began to break up and maintenance changed from a periodic nuisance to a chronic and maddening problem. Something had to be done to bring this section of road up to somewhere near the strength necessary to carry the new loads, and this something had to make maximum use of local materials.

To gain as much bearing value as possible from the old roadway, it was decided to preserve intact the old shell surface and its thin crust. The embankment was widened to 36 feet. But early in our thinking, we realized that the "mud-pumping" condition would continue to be a problem unless steps were taken to alleviate it. Also, we realized that the solution would have to be rather revolutionary.

With this thought in mind, plans were made to lay four inches of hot-mix asphalt blanket course full width of the embankment. This was designed as a dense-graded material incorporating a high asphalt content ranging from six to nine percent. The asphalt cement used had a penetration at 77°F. of 150-200. Minimum Marshall stability was held at 600 pounds. All these factors were designed to maintain a highly flexible blanket which would resist the intrusion of water from the saturated fill below.

LAYER OF SHELL ADDED

To increase the structural strength of the highway, an eight-inch compacted depth of native shell and sand was placed full width over the hot-mix blanket. This was the same material used in the blanket course and was used in a pit run condition.

After final rolling of this native shell, the top 1.5 inches of material were scarified and treated with one gallon of emulsion per square yard. This stabilized material was then re-compacted to envelope the shell base completely and to provide the shoulders for the completed roadway.

Finally, the hot-mix wearing course was laid, two inches thick and twenty feet wide. The mix design included as aggregates:

Native shell—60 percent plus or minus 10 percent
Coarse and fine sand—40 percent plus or minus 10 percent

DEFIED HURRICANE AUDREY

The performance of this design has been most encouraging. During Hurricane Audrey in 1957 this length of roadway was completely inundated, but the only immediate effect was to wash away a portion of the shoulders and destroy four 15-foot strips of wearing course in one section where the storm-swept current raged across the roadbed at its peak velocity. No damage at all was sustained in the asphalt blanket which kept the base material dry and intact.

Since that time other effects of the hurricane and subsequent reconstruction traffic have become evident in the wearing course, showing up as rutting in the traffic paths. Cause of this distress has been traced to the stabilized native shell which reacted in a detrimental way to the strong saline tides during the hurricane. The effect has been to soften the material which trends to move under traffic loads, allowing the wearing course to rut.

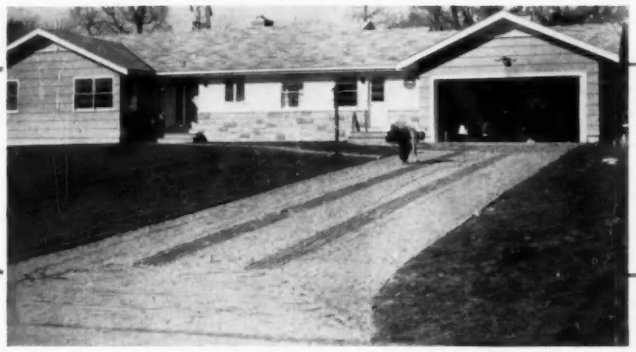
Despite these structural weaknesses exposed by the hurricane, the membrance-wrapped base design offers considerable promise for use on these "floating" coastal highways in Louisiana.

Old pavement was strengthened with four inches of hot-mix asphalt.

Here is the completed roadway, new approach to an age-old problem.

Here's A Hot One!

Heated Driveway Shrugs off Ice and Snow



Electrician checks out cable installation before pavement is laid.

Asphalt truck backs into driveway over cable which, being flexible, may be moved temporarily, if necessary, then replaced in position.

Paving contractor's crew spreads hot mix on buried electric cable.

Paving operation is conducted in the usual way.

Standard equipment is used to roll the hot mix.

Contractor sign marks another heated driveway.

Tired of shoveling out that long driveway after snowstorms? General Electric has adapted the old-fangled electric blanket idea to driveway pavements. The pictures tell the story of how a heating cable was installed under a 90-foot driveway in Trumbull, Connecticut, by the Silliman Company of Bridgeport, which is promoting the idea as a package paving deal.

DON L. NIELSEN,
Chairman, Board of Directors,
The Asphalt Institute

A 35-year-old native Californian steps in as chairman of the Board of The Asphalt Institute for 1959. At the end of World War II, Mr. Don L. Nielsen left the controls of a B-17 bomber of the 8th Air Force and went to work for the Union Oil Company of California, pioneer asphalt producer in the United States. In a sense, Mr. Nielsen literally worked his way up the Union ladder while, simultaneously, working his way down to the bottom of the petroleum barrel. After nearly four years in the Oakland-San Francisco area, he was transferred to Los Angeles and advanced through the traffic department to asphalt dispatcher, then to manager of the Asphalt Sales Division eight years ago.

TURNING THE CORNER

By Don L. Nielsen

A year ago this time, the asphalt industry was making a sober appraisal of its position. For the first time in several years, tonnage had drifted down from the previous peak. There were alarming signs that many state officials at the policy-making level were abandoning the economy of asphalt paving to follow the will-o-the-wisp of "easy" Federal largesse. Finally, in the wake of the Kelly airfield paving fiasco and a Congressional inquiry into Air Force paving policy, the industry faced a new and even more critical pavement test.

To say that the industry was uneasy is putting it midly.

As we round the corner into 1959, our position is vastly improved. We have seen an overall increase in asphalt sales of seven percent during 1958, wiping out the 1957 decline and restoring tonnage figures to the record level of 1956. More than that, we can reasonably expect to surpass that figure in the year ahead. The great Federal-aid road program is now moving into high gear with more projects reaching the paving stage.

There are heartening indications that resistance is rising against runaway extravagance in road-building. Engineering restraint is beginning to assert itself as a brake against headlong spending. In some unexpected quarters champions of asphalt economy have arisen with gratifying results.

The picture, as we close out the year 1958, is both clearer and brighter.

However, the road ahead is strewn with boulders and the going is still decidedly uphill. To borrow a military phrase, there remain several conspicuous pockets of resistance to the logic of asphalt paving.

Meanwhile, our competition is becoming increasingly aggressive in asserting its own engineering doctrine. We are winning converts to our philosophy of road-building, but they are not being won easily. The opposition is reacting violently to every shift in sentiment by those states which have long been under the influence of the rigid paving concept. We can expect this type of response to our own efforts to continue.

The results of the Columbus Air Force Base paving test were gratifying. They effectively laid the ghost of the unfortunate Kelly test of two years ago. This year we will be watching with equal interest the developments in Illinois where the heralded AASHO road test has been launched. We are confident that this will be another successful performance for asphalt paving.

These are some reflections as we turn the corner on another year. Undoubtedly we can face the coming year with a greater degree of confidence than was the case a year ago. But we must recognize that there are old problems which will continue to plague us, and we must be prepared to cope intelligently with the new ones that will arise.

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Bottom row—J. S. Van Pelt, Berry Refining Co., Chicago; Jeff P. Royder, Houston; Chairman Don L. Nielsen, Union Oil Co. of California, Los Angeles; E. M. Stone, Empire Petroleum Co., Denver; and C. W. Turner, American Bitumuls & Asphalt Co., San Francisco. Top row—J. J. Tumpeer, Witco Chemical Co. (Pioneer Products Division), New York, treasurer; L. W. Walker, Leonard Refineries Inc., Alma, Mich.; retiring chairman, D. H. Jenks, Jr., Ashland Oil & Refining Co., Ashland, Ky.; M. O. Hardy, D-X Sunray Oil Co., Tulsa; and W. N. Ruppel, The Atlantic Refining Co., Philadelphia. Not present for the picture were R. B. Lewis, Shell Oil Co., New York; F. L. Dunlap, Richfield Oil Corp., Los Angeles; and E. E. Scholer, Shell Oil Co., St. Louis.

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